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मानक

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Mazdoor Kisan Shakti Sangathan

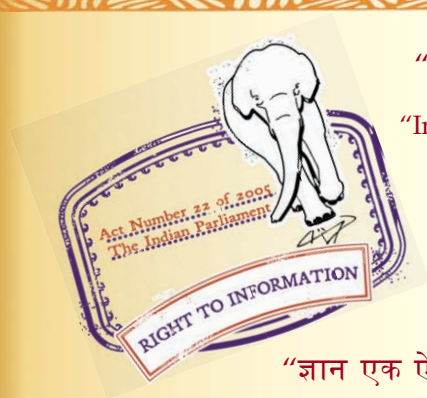
“The Right to Information, The Right to Live”

“पुराने को छोड़ नये के तरफ”

Jawaharlal Nehru

“Step Out From the Old to the New”

IS 8872-4-5 (1984): Variable Resistors, Part 4: Preset, Section 5: Type VRT 5 P [LITD 5: Semiconductor and Other Electronic Components and Devices]



“ज्ञान से एक नये भारत का निर्माण”

Satyanarayan Gangaram Pitroda

“Invent a New India Using Knowledge”



“ज्ञान एक ऐसा खजाना है जो कभी चुराया नहीं जा सकता है”

Bhartrhari—Nitiśatakam

“Knowledge is such a treasure which cannot be stolen”

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(Reaffirmed 2002)

Indian Standard

SPECIFICATION FOR VARIABLE RESISTORS

PART 4 PRESET

Section 5 Type VRT 5 P



0. General — This standard shall be read in conjunction with IS : 8872 (Part 1) - 1977 'Specification for variable resistors : Part 1 General requirements and methods of tests'.

1. Scope — This standard covers the requirements of cermet (non-wire-wound) multi-turn presets for professional applications.

1.1 Outline, Drawing and Dimensions — The outline, drawing and dimensions shall be according to Fig. 1.

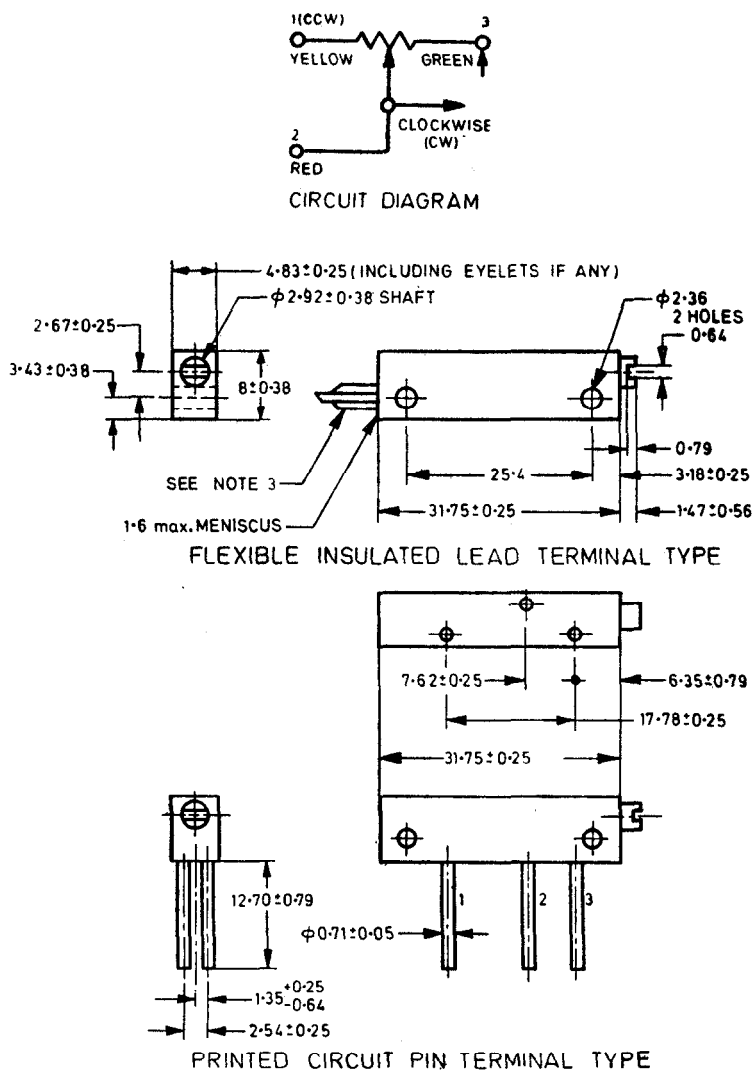


FIG. 1 OUTLINE, DRAWING AND DIMENSIONS

Note 1 — Dimensions are in millimetres.

Note 2 — Unless otherwise specified, tolerance is ± 0.13 mm.

Note 3 — The three leads shall be of standard wire, of diameter 0.25 to 0.32 mm, having a length of 152.4 Minimum; they shall be insulated with PTFE, stripped 6.35 + 1.57 mm from the end and colour coded.

Adopted 30 November 1984

April 1985, ISI

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2. Ratings and Characteristics

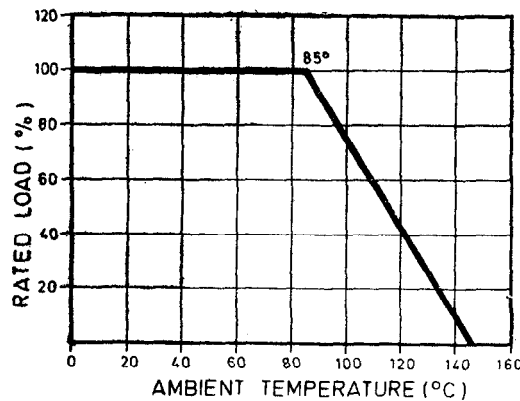
a) Climatic category	55/150/56
b) Low air pressure	4.4 kpa
c) Acceleration	1 km/s ²
d) Bump	4 000 bumps
e) Vibration	10 to 2 000 Hz, 200 m/s ²
f) Shock	1 km/s ²
g) Preferred resistance values	See Table 1
h) Rated working voltage	See Table 1
j) Selection tolerance	± 10 percent
k) Rated dissipation at 85°C	0.75 Watt (see Note)
m) Temperature characteristic of resistance	± 250 ppm/°C and ± 100 ppm/°C
n) Stability after endurance electrical	See SI No. v(a)3 in Table 3
p) Maximum surface temperature	150°C
q) Effective electrical travel	$\left\{ \begin{array}{l} 17 \text{ turns } Min \\ 27 \text{ turns } Max \end{array} \right.$
r) Typical construction	Cermet (non-wire-wound)

Note — For ratings at temperatures other than 85°C, reference shall be made to the derating curve shown in 3.

TABLE 1 PREFERRED RESISTANCE VALUES AND RATED WORKING VOLTAGE

Nominal Total Resistance Value	Maximum Rated Voltage
	V
10 Ω	2.7
	3.8
20 Ω	6.1
100 Ω	8.7
200 Ω	12.3
500 Ω	19.4
1 k Ω	27.4
2 k Ω	38.7
5 k Ω	61.3
10 k Ω	86.7
20 k Ω	122
25 k Ω	136
50 k Ω	194
100 k Ω	274
250 k Ω	300
500 k Ω	300
1 m Ω	300

3. Derating Curve



4. Marking — See 6 of IS : 8872 (Part 1) - 1977. In addition the temperature co-efficient shall also be marked.

5. Material, Construction and Workmanship — See 5 of IS : 8872 (Part 1) - 1977.

6. Tests

6.1 Classification of Tests

6.1.1 Type tests — The sequence of type tests and requirements shall be in accordance with Table 2.

6.1.1.1 Number of samples — The manufacturers shall submit 48 samples in each style for which the approval is required, having the numbers and values as follows :

- 14 samples of the highest value, and 2 spares;
- 14 samples of the lowest value, and 2 spares; and
- 14 samples of the middle value, and 2 spares.

6.1.2 Extension of approval

6.1.2.1 If one termination type in a particular temperature characteristic of resistance of a pattern are approved, the approval may be extended to the variable resistors of other termination types and closer temperature characteristic of resistance or both in the same pattern provided the internal construction is the same and additional testing is performed on the samples as given in 6.1.2.2 and 6.1.2.3.

6.1.2.2 Eight specimens in each of the highest, the middle and the lowest resistance value in each additional termination type shall be submitted for approval testing and these shall be subjected for Groups 0, I, II and III tests.

6.1.2.3 When approval to variable resistors of closer temperature characteristic of resistance is desired, two specimens each of the highest, the middle and the lowest resistance value shall be submitted for approval testing and these shall be subjected to the tests of Groups 0 and VII.

6.1.3 Routine tests — The following shall constitute the routine tests and shall be carried out on each and every resistor :

- Visual examination,
- Continuity,
- Element resistance, and
- Sealing (not applicable to presets with flexible insulated terminals).

6.1.4 Acceptance tests — For the purpose of the acceptance of the lot, all samples shall be subjected to the tests as given in 6.1.3. The following two groups of samples (Group A and Group B) shall be drawn and the resistors in each group shall be subjected to the tests as specified in Table 2.

TABLE 2 SCHEDULE OF ACCEPTANCE TESTS

(Clause 6.1.4)

Sl No.	Tests	Clause Ref in IS: 8872 (Part 1) - 1977	AQL (Percent Defective)	Inspection Level	D/ND
(1)	(2)	(3)	(4)	(5)	(6)
i)	Group A				
	Dimensions	9.1.1			
	Voltage proof (2 seconds)	8.9			
	Operating torque	9.2	I	II	ND
	Contact resistance variation	8.12.4			
ii)	Group B				
	Sub-group B1				
	Solderability	9.8.3	4	S3	ND
	Sub-group B2				
	Resistance to soldering heat	9.8.4	4	S3	D
	Robustness of terminations	9.7			
	Endurance (mechanical) 200 C	11.3			
	Resistance to solvents	11.1			
	Sub-group B3				
	Settability bump	9.10	4	S3	D
	Climatic	10.1			
	Sub-group B4				
	Endurance (electrical) 168 hours	11.4	4	S3	ND

D = Destructive

ND = Non-destructive

Note — See IS : 10673 - 1983 'Sampling plans and procedures for inspection by attributes for electronic items.'

6.2 General Conditions for Tests — See 7 of IS : 8872 (Part 1) - 1977.

6.2.1 The test schedule and the requirements shall be in accordance with Table 3.

TABLE 3 TEST SCHEDULE AND REQUIREMENTS

Sl No.	Test	Clause Ref in IS: 8872 (Part 1) - 1977	Condition of Test	Requirements
(1)	(2)	(3)	(4)	(5)
i)	0 Group (48 samples)			
	a) Visual examination	9.1	—	The condition, workmanship and finish shall be satisfactory. Marking shall be legible and indelible.
	b) Continuity	8.1	The adjustment device of moving contact shall be operated steadily and slowly.	The change in resistance shall be smooth, continuous and unidirectional throughout the actual effective electrical travel.
	c) Dimensions	9.1.1	—	The dimensions of the resistors and their terminations shall conform to the values given in Fig. 1.

(Continued)

TABLE 3 TEST SCHEDULE AND REQUIREMENTS — *Contd*

Sl No.	Test	Clause Ref in IS : 8872 (Part 1) - 1977	Condition of Test	Requirements
(1)	(2)	(3)	(4)	(5)
d)	Element resistance	8.2	—	This shall be within the selection tolerance of ± 10 percent.
e)	Terminal resistance	8.3	—	The end resistance at either end of the resistor shall not exceed 20Ω or ± 2 percent of the total resistance value whichever is greater.
f)	Minimum effective resistance and angle or ineffective rotation :	8.5	—	
	1) Angle of ineffective rotation (from termination 'a')	8.5.1	This is the angle between the two positions recorded above.	The resistance value at angular positions are recorded for information only.
	2) Value of minimum effective resistance (from termination 'a')	8.5.1	This is the resistance value as measured above.	
	3) Angle of ineffective rotation and value of minimum effective resistance (from termination 'c')	8.5.2		
g)	Effective resistance and angle of effective rotation	8.6	—	The angle of effective rotation shall be. 17 turns, <i>Min.</i> 27 turns, <i>Max.</i>
h)	Voltage proof	8.9	900V rms for 1 minute.	No breakdown or flashover shall occur.
j)	Insulation resistance	8.10	500 V	The value shall be not less than $1\,000\text{ M}\Omega$.
k)	Integrity of shaft	—	Resistors shall be mounted on an appropriate mounting fixture with their bodies restrained from movement.	—
	1) Pull force	—	A force of 23 N shall be applied along the axis of the operating shaft, away from the body of the resistor. The force shall be maintained for a minimum of 1 minute.	Resistors shall be examined for evidence of shaft breakage.
	2) Perpendicular force	—	A force of 10 N shall be applied in a direction perpendicular to the axis of the operating shaft for a minimum of 1 minute.	Resistors shall be examined for evidence of shaft breakage.
m)	Operating torque	9.2	The operating torque required to operate the contact arm at approximately 10, 50 and 90 percent of the actual effective electrical travel shall be determined.	The operating torque shall be a maximum of 56.5 m.Nm .
n)	Clutch operation	9.4.2	—	The contact arm shall idle against the stop without electrical discontinuity or evidence of mechanical damage. The travel of the contact arm shall also be capable of reversing direction.

(Continued)

TABLE 3 TEST SCHEDULE AND REQUIREMENTS — *Contd*

Sl No.	Test	Clause Ref in IS: 8872 (Part 1) - 1977	Condition of Test	Requirements
(1)	(2)	(3)	(4)	(5)
p)	Sealing	11.5	Not applicable to styles with flexible insulated terminals.	No bubbling shall occur.
q)	Contact resistance variation	8.12.4	No. of cycles : 6.	The contact resistance variation shall not exceed 3 percent or 20 Ω whichever is greater, for styles with a temperature co-efficient of ± 250 ppm/ $^{\circ}$ C, and 3 percent or 3 Ω whichever is greater for styles with temperature co-efficient of ± 100 ppm/ $^{\circ}$ C.
ii) <i>First Group</i> (12 Samples)				
a)	Settability	—	The resistor wiper shall be set at approximately 30, 50 and 75 percent of mechanical rotation. A dc voltage of up to 2.5 V shall be applied across the end terminals, and the wiper shall then be adjusted smoothly without abrupt voltage change at each test point. The settability error shall be within the limits specified.	The settability error shall be ± 1 percent maximum.
b)	Solderability	9.8.3	Not applicable to flexible insulated terminals.	As in IS : 8872 (Part 1) - 1977.
c)	Robustness of terminations	9.7	Tensile : 10 N. In addition, the test shall be carried out in the opposite direction except for flexible insulated terminals. Bending (Not applicable to flexible insulated terminals); one bend, to be bent through 90 $^{\circ}$.	As in IS : 8872 (Part 1) - 1977.
d)	Bump*	9.10	4 000 bumps.	
	1) Setting stability	—	—	The change shall not exceed ± 1 percent.
	2) Continuity	8.1	—	As in Sl No. (i) (b).
	3) Element resistance	8.2	—	The change in the resistance from the initial value shall not exceed $\pm (1 \text{ percent} + 0.05 \Omega)$
	4) Visual examination	9.1	—	There shall be no fracture, loosening of parts or other mechanical damage.
e)	Vibration*	9.9	10 to 2 000 Hz, 200 m/s ^{2} .	
	1) Setting stability	—	—	The change shall not exceed ± 1 percent.
	2) Continuity	8.1	—	As in Sl No. (i) (b).
	3) Element resistance	8.2	—	The change in the resistance from the initial value shall not exceed $\pm (1 \text{ percent} + 0.05 \Omega)$.

*Throughout the test the resistors shall be connected to a suitable monitoring device to determine electrical discontinuity. It is desirable that the detecting equipment shall detect any interruption with a duration of 0.1 millisecond or greater.

(*Continued*)

TABLE 3 TEST SCHEDULE AND REQUIREMENTS — *Contd*

Sl No.	Test	Clause Ref in IS : 8872 (Part 1) - 1977	Condition of Test	Requirements
(1)	(2)	(3)	(4)	(5)
	4) Visual examination	9.1	—	There shall be no fracture, loosening of parts or other mechanical damage.
f)	Shock*	9.11	1 km/s ²	
	1) Setting stability		—	The change shall not exceed ± 1 percent.
	2) Continuity	8.1	—	As in Sl No. (i) (b).
	3) Element resistance	8.2	—	The change in the resistance from the initial value shall not exceed $\pm (1 \text{ percent} + 0.05 \Omega)$.
	4) Visual examination	9.1	—	There shall be no fracture, loosening of parts or other mechanical damage.
g)	Acceleration*	9.12	1 km/s ²	
	1) Setting stability		—	The change shall not exceed ± 1 percent.
	2) Continuity	8.1	—	As in Sl No. (i) (b).
	3) Element resistance	8.2	—	The change in resistance from the initial value shall not exceed $\pm (1 \text{ percent} + 0.05 \Omega)$.
	4) Visual examination	9.1	—	There shall be no fracture, loosening of parts or other mechanical damage.
h)	Rapid change of temperature	10.5.1	55/150	
	1) Setting stability		—	The change shall not exceed ± 1 percent.
	2) Continuity	8.1	—	As in Sl No. (i) (b).
	3) Element resistance	8.2	—	The change in resistance from the initial value shall not exceed : ± 2 percent for styles with the temperature co-efficient of $\pm 250 \text{ ppm}/^\circ\text{C}$. $\pm (1 \text{ percent} + 0.05 \Omega)$ for styles with the temperature co-efficient of $\pm 100 \text{ ppm}/^\circ\text{C}$.
	4) Visual examination	9.1	—	There shall be no fracture, loosening of parts or other mechanical damage.
j)	Climatic tests	10	—	—
	1) Dry heat	10.1.2	At + 150°C, 16 h	—
	2) Damp heat (accelerated)	10.1.3	1 cycle	—
	3) Cold test	10.1.4	At — 55°C, 2 h	—

*Throughout the test the resistors shall be connected to a suitable monitoring device to determine electrical discontinuity. It is desirable that the detecting equipment shall detect any interruption with a duration of 0.1 millisecond or greater.

(Continued)

TABLE 3 TEST SCHEDULE AND REQUIREMENTS — *Contd*

Sl No.	Test	Clause Ref in IS : 8872 (Part 1) - 1977	Condition of Test	Requirements
(1)	(2)	(3)	(4)	(5)
	4) Operating torque	9.2	—	The value shall not exceed 1.5 times the maximum value specified in SI No. (i) (m).
	5) Low air pressure	10.1.5	4.4 kPa The voltage proof test shall be done at 350 V rms.	No breakdown or flashover shall occur.
	6) Damp heat (accelerated) remaining cycles	10.1.6	5 C	—
	i) Working test	—	The voltage to be applied shall be the rated voltage.	No breakdown or flashover shall occur.
	1) Visual examination	9.1	—	There shall be no corrosion fracture, loosening of parts or other mechanical damage. Marking shall be legible and indelible.
	2) Continuity	8.1	—	As in SI No. (i) (b).
	3) Element resistance	8.2	—	The change in resistance from the initial value shall not exceed: ± 2 percent for styles with the temperature co-efficient of ± 250 ppm/°C. $\pm (1 \text{ percent} + 0.05 \Omega)$ for styles with the temperature co-efficient of ± 100 ppm/°C.
	4) Insulation resistance	8.10	—	The value shall be not less than 100 M Ω .
	5) Voltage proof	8.9	—	There shall be no breakdown or flashover.
iii) <i>Second Group (6 samples)</i>				
	a) Damp heat (long term)	10.2	A dc voltage of 20 ± 2 V shall be applied to half the specimens between termination <i>b</i> and the external metal parts (termination being positive) and no voltage shall be applied for the other half specimens.	—
	i) Working test	—	The voltage to be applied shall be the rated voltage.	There shall be no breakdown or flashover.
	1) Visual examination	9.1	—	There shall be no corrosion fracture, loosening of part or other mechanical damage. Marking shall be legible and indelible.
	2) Element resistance	8.2	—	The change in resistance from the initial value shall not exceed: ± 2 percent for styles with the temperature co-efficient of ± 250 ppm/°C. $\pm (1 \text{ percent} + 0.05 \Omega)$ for styles with the temperature co-efficient of ± 100 ppm/°C.
	3) Insulation resistance	8.10	—	The value shall be not less than 100 M Ω .

(Continued)

TABLE 3 TEST SCHEDULE AND REQUIREMENTS — *Contd*

SI No.	Test	Clause Ref in IS : 8872 (Part 1) - 1977	Condition of Test	Requirements
(1)	(2)	(3)	(4)	(5)
	4) Voltage proof	8.9	—	There shall be no breakdown or flashover.
	5) Solderability	9.8.3	—	As in SI No. (ii) (b).
iv) <i>Third Group (6 Samples)</i>				
a) Endurance (mechanical)		11.3	200 Cycles, 1 cycle in 2 ± 0.5 min. The specimens shall be mounted by their normal mounting means on a 1.6 mm thick glass epoxy laminate. The specimens shall be ganged in pairs and each pair shall be connected in series so that a nominally constant current flows through the resistors, irrespective of the contact arm position during the turning of the lead screw actuator.	—
	1) Visual examination	9.1	—	There shall be no fracture, loosening of parts or other mechanical damage.
	2) Continuity	8.1	—	As in SI No. (i) (b).
	3) Element resistance	8.2	—	The change in resistance from the initial value shall not exceed ± 2 percent.
v) <i>Fourth Group (6 Samples)</i>				
a) Endurance (electrical)		11.4	At $+ 85^{\circ}\text{C}$ The specimens shall be pre-conditioned at the test temperature for a period of 8 hours before the start of the test. The specimens shall be mounted by their normal means on a 1.6 mm thick glass epoxy laminate. The specimens shall be so arranged that the temperature of any one specimen shall not appreciably influence the temperature of any other specimen. There shall be no undue draft over the resistors.	—
	1) Visual examination	9.1	—	There shall be no fracture, or any other mechanical damage. Marking shall be legible and indelible.
	2) Continuity	8.1	—	As in SI No. (i) (b).
	3) Element resistance	8.2	—	The change in resistance from the initial value shall not exceed : ± 3 percent for styles with the temperature co-efficient of ± 250 ppm/ $^{\circ}\text{C}$. ± 2 percent for styles with the temperature co-efficient of ± 100 ppm/ $^{\circ}\text{C}$.

(Continued)

TABLE 3 TEST SCHEDULE AND REQUIREMENTS — *Contd*

Sl No.	Test	Clause Ref in IS : 8872 (Part 1) - 1977	Condition of Test	Requirements
(1)	(2)	(3)	(4)	(5)
	4) Insulation resistance	8.10	—	As in Sl No. (i) (j).
	5) Voltage proof	8.9	—	No breakdown or flashover.
	6) Setting stability		—	The change shall not exceed ± 1 percent.
	7) Operating torque	9.2	—	The value shall not exceed 1.5 times the maximum value specified in Sl No. (i) (m).
	b) Flammability	11.2	—	As in IS : 8872 (Part 1) - 1977
vi)	<i>Fifth Group (3 Samples)</i>			
	a) Mould Growth	10.4	—	As in IS : 8872 (Part 1) - 1977.
vii)	<i>Sixth Group (3 Samples)</i>			
	a) Resistance to solvents	11.1	—	As in IS : 8872 (Part 1) - 19 7.
	b) Resistance to soldering heat	9.8.4	Not applicable to styles with flexible insulated terminals.	
	1) Visual examination	9.1	—	There shall be no fracture, loosening of parts or other mechanical deterioration.
	2) Element resistance	8.2	—	The change in resistance from the initial value shall not exceed $\pm (1 \text{ percent} + 0.05 \Omega)$.
viii)	<i>Seventh Group (6 Samples)</i>			
	a) Temperature characteristic of resistance	8.11	The temperature condition in <i>See 2 (k)</i> . step (d) and (f) shall be 85°C. Drying as per procedure II.	
	b) Salt mist	10.3	—	
	1) Visual examination	9.1	—	There shall be no corrosion loosening of parts or other mechanical deterioration. Marking shall be legible and indelible.
	2) Element resistance	8.2	—	As in Sl No (i) (c).
	3) Insulation resistance	8.10	—	As in Sl No (i) (j).
	4) Operating torque	9.2	—	As in Sl No (i) (m).
ix)	<i>Spare (6 Samples)</i>			

EXPLANATORY NOTE

While preparing this standard, assistance has been derived from JSS: 50505 'Detail specification for resistors, variable, non-wire-wound, adjustment type'; issued by Ministry of Defence, New Delhi. The corresponding JSS pattern is RVB1.